Mannans and endo-β-mannanases (MAN) in germinating seeds: from *Arabidopsis thaliana* to *Hordeum vulgare*

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In endospermic eudicot seeds, germination *sensu stricto* occurs in two sequential steps where seed coat rupture is followed by the endosperm layer breakage. The endosperm cells of these seeds have cell walls (CWs) frequently rich in mannans that contribute to strong mechanical resistance for the radicle protrusion. Endo-β–mannanases (MAN; EC. 3.2.1.78) are hydrolytic enzymes that catalyze cleavage of β-1,4 bonds in the mannan-polymer. In *Arabidopsis thaliana* seeds, the *AtMAN7* gene is the most highly expressed in seeds upon germination and their transcripts are restricted to the micropylar endosperm and to the radicle. Interestingly, mutants with a T-DNA insertion in this gene (*K.O. AtMAN7*) have a slower germination rate than controls. *AtMAN7* is transcriptionally activated by AtbZIP44. Exploring the transcription factor (TF) AtbZIP44 interactome, by screening an arrayed yeast library of *circa* 1,200 TFs from *A. thaliana* (Y-2H assays), the AtbZIP9 has been identified and its physiological implication in the combinatorial transcriptional regulation of *AtMAN7* established.

The Triticeae *sensu stricto* seed germination also occurs in two steps: the coleorhiza emergence (CE) occurs after pericarp and testa rupture, followed by the root emergence (RE). Mannan content in the coleorhiza and root of these seeds decrease upon imbibition (from 12-30 h), while the MAN activity increases concurrently. In the genome of *Hordeum vulgare*, the MAN family is represented by six members, but only three *HvMAN* genes are highly expressed upon germination. Molecular characterization of these genes (i.e., RT-qPCR analyses and mRNA *in situ* localizations), together with data on mannans and MAN activity, suggest that the coleorhiza in the Triticeae and the micropylar endosperm in eudicots germinating seeds may have similar functions.

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